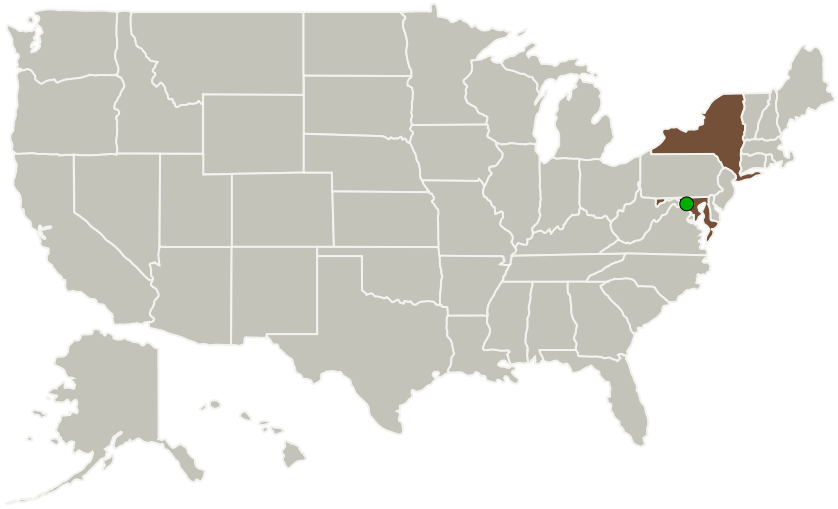
Low-power Broadband Digitizer for Millimeter-Wave Sensor Array Readout, Phase I

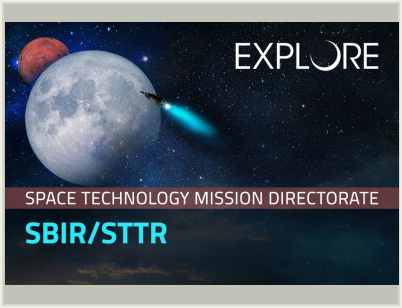
Completed Technology Project (2011 - 2011)

Project Introduction

Multiplexing in frequency domain using a bank of high-Q micro-resonators is an emerging method of reading out large arrays of transition-edge sensors and kinetic-inductance detectors. Low-power digitization of the resultant wide multi-GHz frequency band (e.g., 2-8 GHz) using a broadband superconductor analog-to-digital converter (ADC) enables high fidelity digital readout with immunity from noise, interference and cross-talk. HYPRES, Inc. has recently demonstrated a series of broadband digital radio receivers, built around a fast superconductor ADC. This ADC has low noise, low power, high linear dynamic range, and high radiation resistance. HYPRES proposes to design a similar ADC which is optimized for readout of a frequency-multiplexed sensor array such as that in the MicroSpec far-infrared spectrometer now being developed by NASA GSFC for future space missions. The superconductor ADC can be closely integrated and matched with the cryogenic sensors, enabling both reduction in system power and scaling to large imaging arrays. During Phase I, HYPRES will adapt a phase modulation-demodulation ADC for broadband (8 GHz) input, layout and fabricate an IC combining ADC with digital readout circuitry, and measure ADC performance with RF tones and an RF comb to simulate the frequency-multiplexed output of a sensor array. We will also assess the digital readout system for noise and thermal budget, and design the array interface for Phase II implementation. During Phase II, HYPRES will work with GSFC to integrate the ADC with a system testbed for the MicroSpec spectrometer and demonstrate its performance.

Primary U.S. Work Locations and Key Partners





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Organizations Performing Work	Role	Type	Location
HYPRES, Inc.	Lead Organization	Industry	Elmsford, New York
Goddard Space Flight Center(GSFC)	Supporting Organization	NASA Center	Greenbelt, Maryland

Primary U.S. Work Locations	
Maryland	New York

Project Transitions

February 2011: Project Start

September 2011: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/138278)*

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

HYPRES, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

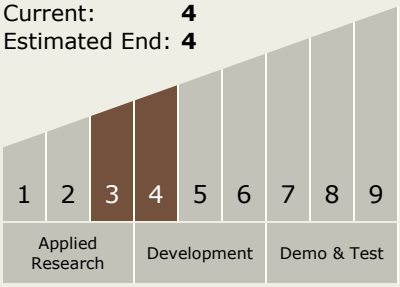
Carlos Torrez

Principal Investigator:

Deepnarayan Gupta

Technology Maturity (TRL)

Start: **3**
Current: **4**
Estimated End: **4**



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Technology Areas

Primary:

- TX02 Flight Computing and Avionics
  - TX02.2 Avionics Systems and Subsystems
    - TX02.2.6 Data Acquisition Systems

Target Destinations

The Moon, Mars, Outside the Solar System, The Sun, Earth, Others Inside the Solar System